Sr. No	Appraise/ Trials	Part										Average
		1	2	3	4	5	6	7	8	9	10	
1	A 1	0.319	-0.616	1.474	0.517	-0.88	0.022	0.649	-0.341	2.486	-1.496	
2	2	0.451	-0.748	1.287	0.55	-1.012	-0.121	0.825	-0.22	2.189	-1.375	
3	3	0.704	-0.638	1.397	0.704	-0.924	-0.231	0.726	-0.187	2.211	-1.441	
4	Average	0.491	-0.667	1.386	0.590	-0.939	-0.110	0.733	-0.249	2.295	-1.437	$\overline{X}_a$ =
5	Range	0.385	0.132	0.187	0.187	0.132	0.253	0.176	0.154	0.297	0.121	$\overline{R}_a$ =
6	B 1	0.088	-0.517	1.309	0.011	-0.616	-0.22	0.517	-0.6941	1.98	-1.848	
7	2	0.275	-1.342	1.034	1.133	-1.32	0.242	0.605	0.088	2.332	-1.782	
8	3	0.077	-0.748	1.474	0.22	-1.408	0.066	0.913	-0.374	2.409	-1.65	
9	Average	0.147	-0.869	1.272	0.455	-1.115	0.029	0.678	-0.327	2.240	-1.760	$\overline{X}_b$ =
10	Range	0.198	0.825	0.44	1.122	0.792	0.462	0.396	0.7821	0.429	0.18	$\overline{R}_b$ =
11	C 1	0.044	-1.518	0.968	0.154	-1.606	-0.319	0.022	-0.506	1.947	-1.639	
12	2	-0.121	-1.243	1.199	0.22	-1.177	-0.737	0.011	-0.616	1.595	-1.947	
13	3	-0.165	-1.056	0.737	0.121	-1.595	-0.539	0.231	-0.539	2.057	-2.376	
14	Average	-0.081	-1.272	0.968	0.165	-1.459	-0.532	0.088	-0.554	1.866	-1.987	$\overline{X}_C$ =
15	Range	0.209	0.462	0.462	0.099	0.429	0.38	0.2	0.1	0.42	0.67	$\overline{R}_C$ =
16	Part Average	0.186	-0.936	1.209	0.403	-1.171	-0.204	0.500	-0.377	2.134	-1.728	$\overline{X}_d$ =
												Rp =
17	$\overline{\overline{R}}$ = (Ra+Rb+Rc)/3 =											
18	$\overline{X}$ diff. = max. $\overline{X}$ − min. $\overline{X}$ =											
19	$UCL_R = [\overline{\overline{R}} = \_\_\_\_\_] \times [D_4 = 2.574] =$											
	* D_4 = 3.268 for 2 trials and 2.574 for 3 trials. UCL_R represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute and the limiting value from the remaining observations.											

Table 1 Measurement data, averages, range and limits

UCL_R represents the upper limit of individual Ranges (R). Causes for ranges beyond this limit are identified and following action taken. Repeat readings using the same appraiser and unit as originally used or Discard > limit values and re-compute Average and R and limiting values from remaining observations.

Part No. & Name	Gauge Name:	Date:
Characteristics:	Gauge No.:	Performed by:
Specifications:	Gauge Type:	
From data sheet: $\overline{\overline{R}}$ =	$\overline{X}_{DIFF}$ =	R_p =

Measurement Unit Analysis	% Total Variation (TV)
Repeatability – Equipment Variation (EV) EV = $\overline{\overline{R}} \times K_1$ = _____ x _____ = _____	% EV = 100 [EV / TV] = 100 [_____/_____] = _____
Reproducibility – Appraiser Variation (AV) AV = $\sqrt{(\overline{X}_{DIFF} \times K_2)^2 - (EV^2/(nr))}$ = $\sqrt{(\_\_\_\_\_ \times \_\_\_\_\_)^2 - (\_\_\_\_\_)^2/(10\times3)}$ = _____ *n = parts r = trials*	%AV = 100 [AV / TV] = 100 [_____/ _____] = _____
Repeatability & Reproducibility (GRR) GRR = $\sqrt{EV^2 + AV^2}$ = $\sqrt{(\_\_\_\_\_)^2 + (\_\_\_\_\_)^2}$ = _____	%GRR = 100 [GRR / TV] =100 [_____/_____] = 26.85%
Part Variation (PV) PV = $R_p \times K_3$ = _____× _____ = _____	%PV = 100 [PV / TV] = 100 [_____/_____] = _____
Total Variation (TV) TV = $\sqrt{GRR^2 + PV^2}$ = $\sqrt{(\_\_\_\_\_)^2 + (\_\_\_\_\_)^2}$ = _____	

Trials	K_1
2	0.8862
3	0.5908

Appraisers	2	3
K_2	0.7071	0.5231

Parts	K_3
2	0.7071
3	0.5231
4	0.4467
5	0.4030
6	0.3742
7	0.3534
8	0.3375
9	0.3249
10	0.3146

Table 2 Calculation of Gage R&R

Gage R&R acceptance guide lines provided by AIAG are as follows:

- % R&R 10% - Gauge System Okay (Most variation caused by parts, not people or equipment).
- % R&R>10% but 30% - May be acceptable based on importance of application and cost of gauge or repair.
- % R&R > 30% - Gauge system needs improvement (People and equipment cause over 1/3 of variation).